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Dichromatism in the Genus *Carpodacus*

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[Read before the Northern Division of the Cooper Orn. Club,]

OCASIONAL finches, in which yellow is present or even predominant over the red, must come to the notice of every field ornithologist of the west; in fact we may look for some yellow feathers in about one-half the males of this group. *Loxia*, *Pinicola* and probably other genera have a yellow phase of regular occurrence in the immature plumage. It is this dichromatism which led me to make a few remarks before the Club—not with the intention of reporting anything new but with the hope that some members might take an interest in what has interested me.

The following notes were made on specimens of *Carpodaci* in my collection and treat of the occurrence of yellow among the North American species. I am unfortunate in having no representatives of Mexican forms but these would doubtless show the same variations in plumage color.

Yellow feathers are rare in *Carpodacus purpureus californicus* and I have never seen them in *C. cassini*. Of the former race Mr. T. E. Slevin has two males in which a few yellow feathers occur on the breast. They were taken at Fairfax, California, in December. In the subgenus *Burricea*, including as it does the so-called house finches, the yellow phase is common and these plumages will now be described for each race examined.

Among the finches from the San Benito Islands (*C. mcgregori*), I have never seen two alike. The colors range from bright crimson through orange into lemon yellow with all manner of variations resulting from combinations of these colors and their shades or tints. It is impossible to take any example and say it is the typical coloration.

The finch of Guadalupe Island (*C. amplus*) shows more stability in its coloration but even here we often find

birds varying from the normal. Of seventeen males before me, nine, or over one-half, are more or less yellow. In two of these the rump, head, and breast are clear lemon yellow, in a third the feathers are about equally red and yellow, of a pale washed-out look. The remaining six have a few yellow feathers irregularly mixed with the crimson. The proportion of yellow birds which really occurs in probably less than the above figures would indicate as this series was selected, somewhat, with a view to getting the abnormal examples.

Among mainland birds (*C. m. obscurus*), great deviation from the crimson type is rarer, though even here it is surprising how many shades of color occur. In a series of over fifty males before me including skins from Colorado, nearly the whole length of California, and four from northern Lower California there are thirty-three in which more or less yellow occurs. However, four only are strikingly different from the normal, three being yellow with no red and one almost orange with very few yellow feathers. Twenty-nine possess from one or two to a dozen lemon colored feathers mixed among the red. Among the red examples, too, there is great variation. Many are a deep rose pink (young of the year?), others are crimson or near vermillion. Birds taken just before or during breeding season have an indescribable lustre which is only ascribable to intensification or addition of pigment.

Of six examples from Coronado and San Clemente Islands (*C. clementis*), one from each island has a few yellow feathers; another from Coronado is almost brick red.

Even in *C. ruberrimus* from San Jose del Cabo, we find cases of reversion, for although this form is 'very red' as its name indicates, there are occasional specimens with yellow feathers. I have

managed to get six of these. Two are in immature plumage, one shows an inclination to orange, and three have yellow in patches.

Pains have been taken to make this list in some detail in order to show how frequent is the tendency to yellow; so frequent is it that we are hardly justified in calling it an abnormal condition. The hypothesis that yellow is a more primitive color than red finds additional evidence in another genus, *Cyanospiza*. A spring male of *C. ciris* taken in Georgia has one yellow feather in its breast and five in its throat. Another male of this species shows yellow on the flank.¹

That these facts point to an ancestral bird of yellow plumage seems most reasonable to answer a question as to why so many birds are off color.

Mr. Charles A. Keeler has suggested that yellow is the more primitive color and red an intensification of the same pigment, although he gives no experimental data to support his opinion. So high an authority as Dr. R. W. Shufeldt wrote me, October 10, 1899, in regard to this subject: "I am inclined to agree with Mr. Keeler that *yellow* birds preceded *red* ones in the history of the group *in time*, and thus viewed, red may be but an intensification of the former color." Mr. J. Armory Jefferies says: "Red feathers as those of the Flamingo, Cardinal Bird, and the like, are so colored by a red pigment similar to the yellow one."²

Keeler³ has called attention also to the fact that the House Finch when kept in captivity changes from red to yellow, and that⁴ "many birds appear to become more brilliant in color as the breeding season approaches without either a moult or the wearing away of the tips of the feathers." This last point is indicated by the series of

finches in my collection. He says:⁵ "It is difficult to say whether the change in color of the caged house finch (*Carpodacus mexicanus frontalis*) from red to yellow is due principally to a change in food, or to the confinement and general deterioration of the system from captivity. Food nevertheless, plays some part in this, as well as in many changes in the color of birds in the wild state, which, with the present lack of experimental data, are far too complex even to be surmised."⁶

I have quoted at length from Keeler in order to emphasize the richness of material ready to our hand. Here is an excellent chance for interesting and valuable experimentation. A study of the color change in our commonest bird would give big returns for the time invested. For such work, however, one should be permanently located where continuous out-of-door work might be done for a year or more.

One more extract from Keeler's work may not be out of place. "The most significant interrelation of colors, however, and one which I believe to be of wide application in the explanation of bird colors, is that between yellow and red. Whether these two colors are produced by the same or a different pigment I am unable to say; but, however this may be, there is a high degree of probability that the red is simply an intensification of the yellow. There is much to show that yellow is a more primitive stage than red, and that the latter has always or nearly always been developed from the former."⁷

It is to be hoped that someone who has time and facilities will feel enough interest in this matter to make at least a study of the moult and of the effect of food supply, varied as to quantity and and quality.



1. NOTE—Since writing the above I have examined a beautiful series of Hawaiian Island species, *Vestiaria coccinea*, in the collection of Mr. H. W. Henshaw of Hilo. In the adult plumage this bird is entirely red. The young, however, are yellow and Mr. Henshaw's lot shows the gradual change from yellow to red.

2. Bull. Nut. Ornith. Club. VII. P. 131.
 3. Evolution of Colors of N. A. Land Bds. P 156.
 4. I. c. p. 136.
 5. I. c. p. 229.
 6. See on this subject, Birtwell, *Auk* XVI. p. 313.
 7. I. c. p. 154.